

THE S I S  
O N  
THE PRESENT POSITION  
OF RINGWORM AND ALOPECIA  
AREATA.

presented by

T H O M A S J. T H O M S O N ,

M.B.,C.M., Edin.Univ. 1893.

April, 1899.

## THE PRESENT POSITION OF RINGWORM AND ALOPECIA AREATA.

Ringworm is a very common disease, and on this account, as well as because of its intractability, it is very important. Typical cases are easily recognised, more especially when the head is affected; so much is this the case that the old women of our poorer classes are quite capable of making, in many cases, a correct diagnosis, and can (and frequently do) undertake its treatment. It has been known and recognised as a distinct disease certainly since 1829 when we find a clear description of it by Mahon; but in the earlier editions of Cazenave and Schedel's work in 1828 we find no mention of it. Cazenave recognised it in one of the large schools of Paris in 1840, and in 1850 he calls it Herpes tonsurans.

### Varieties.

Ringworm may affect any part of the body, but shows decided preference for certain positions - the head, the beard, the sides of the neck, and the back and outer sides of the hands and wrists. It takes on different forms according to the part affected.

The Scalp.

Ringworm of the head is most common in children - indeed it may be called a child's trouble, so few adults are attacked by it. The commonest age at the Edinburgh Royal Infirmary Skin Department is between five and ten years. Children are liable to have it at all ages up to puberty; but after ten years this liability diminishes and after fourteen the disease is much more amenable to treatment; and after sixteen not only is there little chance of a child being attacked, but cases already existing tend to undergo spontaneous cure. Infants have been known to have the disease, and cases have been reported as young as one week. Epstein of Prague, has, indeed, seen a series of cases in infants from two to three weeks old and thinks it not uncommon at this age. Liveing<sup>(1)</sup> is of opinion that young infants are quite as liable to it as older children, "but" he says, "they are generally washed all over once or even twice a day, and therefore the spores have not the same opportunity of taking root; moreover, in infants, in consequence of the poorly developed hair, the disease is easily cured by very mild home remedies without medical help."

(1)  
Liveing.  
Hndbk. of  
Dis. of the  
Skin. p.390

There have also been recorded some cases of adults suffering from scalp ringworm. Drs. Jamieson, Crocker, and Thin have each recorded two cases, Dr. Aldersmith has seen five, and Mr. Malcolm Morris, six cases; and Drs. Fox and Blaxall mention one case in a foot note to their paper in the British Journal of Dermatology of 1896. What produces this immunity in adults is not known, but Dr. Crocker<sup>(2)</sup> thinks that the hair of adults is more resistant to the fungus, to which the disease is due, and that though it may pass down into the follicle and interfere with the nutrition of the hair, it is unable to penetrate the shaft, and mentions beard ringworm as showing that it cannot be entirely a question of age. This does not appear to me to be sufficient because, (1) all children exposed to the affection, even though their hair be not stronger than that of children who are affected, do not take the disease; (2) All parts of the head of the same child are not equally liable; (3) The disease occurs in man on the beard where the hairs are strong; and (4) the theory does not explain the spontaneous cure at puberty.

(2)  
Crocker.  
Dis. of the  
Skin. 1893,  
p. 812.

The two sexes appear to be equally liable; in 94 cases, 48 were boys and 46 girls. Some author-

ities say that fair haired are more susceptible than dark haired. In a country where fair-haired children predominate they must necessarily figure more largely in statistics, but even granting this we observe the fact that the disease is more amenable to treatment in dark-haired children.

Statistics as to the proportion of ringworms to other skin diseases vary in different places; in Edinburgh the proportion of scalp ringworm to other skin affections is 4%, and it forms about 55% of all ringworms.

Clinically there are a great variety of forms presented to us. The patches vary greatly in number and size; there may be only one or very many covering the whole head. The size varies from that of a "threepenny bit" to that of a "florin" or even a "crown;" it seldom exceeds  $2\frac{1}{2}$  inches in diameter except from the coalescence of several patches. The favourite positions for commencing ringworm are the parietal regions or vertex, never low down at the back of the head. It is usually caught by children putting on one another's caps, or from using the same comb or towel, or sometimes at the barbers.

A typical patch is round or oval in shape, with well-defined margin, sometimes erythematous, and very



rarely vesicular. The colour is from a greyish blue to a reddish brown; in fair children it is of a yellowish tinge, or may differ little from the surrounding healthy scalp. The patch is covered by withered, lustreless stumps of hair which present the appearance of having been nibbled, and have been likened to stubble. The stumps are thickened and are surrounded by a whitened sheath; they have lost their elasticity, and when bent over by the examining finger, do not spring back to their original position, as hairs normally do. They may be twisted, and are apparently more easily removed than normal but when examined closely it is found that the whole hair has not been extracted, but has broken off short leaving what is known as the root, behind. Epilation causes no pain. A constant feature is the scurfy appearance of the patch, which is due to epithelial debris. The stumps project about 2 or 3 m.m. from the mouth of the follicle.

There are variations from this typical form. Sometimes the patches are of irregular shape due to two or more coalescing, on the disease may not appear in patches properly so called, only a few hairs being affected at one place, and sometimes even only one hair; to this condition Aldersmith<sup>(3)</sup> has given the

(3)  
Aldersmith.  
Ringworm and  
Alopecia  
Areata 1882,  
p. 15.

name "disseminated ringworm." In other cases the hairs are broken off close to the scalp and nothing is seen over an apparently bald patch but a few black dots; in a day or two, however, these have grown a little and shew themselves for what they are. This variety Aldersmith calls "black dot ringworm." There is another variety in which the patches are perfectly bare of hair but covered with mealy scales; to this Liveing<sup>(4)</sup> gives the name "bald Tinea tonsurans."

(4)  
Liveing.  
Brit. Med. Jr.  
April 8th,  
1882.

A somewhat unusual form is known as Kerion; here a folliculitis takes place. The patch is considerably raised above the surrounding scalp, and is very red and angry looking and tender to touch. The surface is dome-shaped and dilated follicles are visible all over; some of these are mere holes, others are filled with muco-purulent plugs, while others still contain their thickened and loosened hairs. The swelling has a boggy feeling and sometimes gives one the impression that it contains pus, none of which, however, or very little, escapes when it is incised. This is due to the fact that the inflammation is almost, if not strictly, confined to the follicles. The folliculitis being set up the hairs become very loose, and are cast off, and thus a cure takes place. This is nature's method

which however is not always perfect one or two diseased hairs being sometimes left at the margins.

We very seldom see ringworm in its earliest stage. Sometimes we may see developing at the mouth of a follicle, a small red papular elevation which spreads peripherally, becomes scaly, and eventually develops into a typical patch. Usually, however, the patch is already formed and the hairs broken off before we see the case. The rapidity of spread of the disease is variable, depending evidently upon various circumstances, such as the age of the child, whether the hair be coarse or fine, and upon the virulence of the cause; also with the nature of the soil which varies not only in different individuals, but also on different parts of the scalp of the same individual. Sometimes the progress is very rapid; thus Aldersmith says<sup>(5)</sup> "I know it is possible that a ring the size of a sixpence can develop in forty-eight hours, and increase to the size of a florin in another twenty-four hours, because I have actually seen ringworm grow at this rate." It is not, however, common for it to spread so rapidly as this.

Scalp ringworm is a very tedious disease, the duration of some cases being, indeed, reckoned by years, and even in the most favourable case we cannot

(5)  
Aldersmith.  
Op. Cit.  
p. 58.



expect a cure ( if one may use the term) in less than three months, while from six months to a year is a much more common period.

The Beard. In this situation we find that a few days after infection a number of round spots form on the chin or whisker, of a reddish colour, dry and scaly, and causing a considerable amount of itching. If left untreated these spots spread and the hairs become affected; they are dry and withered and thicker than normal. Sometimes the epidermis presents a blistered appearance and there may be induration and swelling. A yellowish matter exudes from the hair follicles and dries on the surface forming crusts. At a further stage we have a condition like that of "Kerion" of the scalp. Nodular swellings of a red colour form, over which the hairs are quite loose and may even fall out. These nodes are frequently covered with crusts due to the drying of the exudation; when these are peeled off they leave a raspberry like appearance. This is best seen in the space between the lower lip and chin. Here and there single hairs may be diseased and give rise to isolated pustules. This condition may be very wide spread over the hairy part of the face

and cause a very considerable amount of pain. It very seldom attacks the upper lip even when parts immediately adjoining are severely affected. The reason for this is not known.

Being a disease of the hairs it follows that only adult males are subject to parasitic sycosis; the youngest patient at the Edinburgh clinic in the last fifty-four cases was 19 years. The commonest period is between 20 and 30 years, possibly because after 30 most people who are likely to be exposed to it do not shave.

The next form, *Tinea circinata*, may occur upon the beard region but does not affect the hairs only the epidermis being implicated.

#### The Body.

*Tinea circinata* begins as a small spot of a rosy-red colour which soon begins to desquamate and causes some itching. This spot spreads at the margin, and as it spreads the centre becomes paler, giving the typical appearance of the disease, viz:- a red ring surrounding a spot differing little, if any, in

colour from the normal skin. Sometimes the centre remains red and scaly giving rather the appearance of a spot of scaly eczema, except that the edges are too prominent for that disease. Vesicles may sometimes form at the borders. The favourite sites for these patches are the sides of the neck and the outer sides and backs of the wrists and hands, but any part of the body may be affected.

The two sexes are equally liable to this form, and it may occur at any age, but children are more prone to have it than older people, probably because in them the skin is finer and more tender.

A special form, met with in India and hot climates, is known as Eczema Marginatum. It affects the inner aspects of the thighs and the scrotum. The margin is red and raised and crescentic in form. It may be papular or linear and is covered with scales; the centre is fawn-coloured and may be scaly but is frequently moist. Itchiness is always present. The condition is more actively inflammatory than ordinary Tinea circinata, and may cover a very large surface reaching on occasion as high as the waist. It is very obstinate and lasts a long time.

Rare Forms.

In Unguial Ringworm the nails are thickened, dull and brittle and shew scaling. It presents no features to distinguish it by the naked eye from other nail affections such as Favus or Psoriasis. Microscopic examination is the only way in which to make a diagnosis.

The palms of the hands and soles of the feet are sometimes primarily the seat of Ringworm. It appears in the form of blisters which enlarge and burst leaving a smooth pink surface. The fungus may be found in the fluid of the blister.

The mucous membranes also may be affected, in the case of the mouth secondarily to Tinea Circinata of the face, and of the vulva to Eczema Marginatum.

Immunity.

The question whether one attack of Ringworm protects from another is not altogether an easy one to decide. Children, sometimes suffer from what appear to be second attacks, but that they really are so is very doubtful. May they not be relapses rather

than fresh attacks? It is impossible to say they are not, considering the difficulty of finding say one diseased hair among a lot of healthy ones, as for example in disseminated ringworm. Mr. Morris<sup>(6)</sup> though he supports the probability of these apparently second attacks being really relapses says "It is plain, however, that the new hair which grows on a patch where the fungus is still vegetating must in some way be unsuitable for its development." Aldersmith, however, though he admits the occurrence to be rare says that he has known such hair to be re-infected from a distant uncured spot. Mr. Morris<sup>(6)</sup> suggests that it is conceivable that Gottstein's theory of "hardening" of the skin, (as in Vanilla workers who, by one attack of vanilla eczema, are protected from a second), may have some bearing here also. I think, however, that *Tinea Circinata* does not bear this out, because we sometimes in this affection see two or more concentric rings (as many as four have been noted) produced by one or more fresh attacks in the healed centre of an old patch.

Geographical distribution.

The various forms do not seem to be equally prevalent in all countries, thus scalp ringworm is commonest

(6)  
Morris.  
Ringworm in  
the light of  
Recent Research p. 68.



in London and Edinburgh; beard ringworm in Paris and body ringworm in Vienna, while eczema marginatum though hardly uncommon elsewhere is much more prevalent in India, China and Burmah.

Etiology. In 1842 Gruby, in a paper presented to the Academie des Sciences, on a "Species of contagious Mentagra resulting from the growth of a new Cryptogam in the roots of the hairs of the Beard of Man", describes a fungus which establishes itself within the hair-sheath. In 1843 he gave another paper entitled "Researches on the Nature, Seat, and Development of Porrigo Decalvans or Phyto-Alopecia," in which he describes a fungus which he calls "Microsporon Audouinii" and which has a close resemblance to that he had described in the previous paper as occurring in the beard, but is situated around the aerial portion of the hair, and has smaller spores than that variety. Although Gruby calls the disease "Porrigo Decalvans," which name Bateman had given to what we now know as "Alopecia Areata," it is evident that he is describing a form of Ringworm. I therefore mention it here as an addition to our knowledge of Ringworm. In 1844 we have another paper by the same author describing a third fungus as attacking the head and giving rise to

*Tinea tonsurans*. This fungus, he said, took root in the interior of the hair root, in the form of groups of round spores from which filaments proceeded and ran up the hair parallel to its long axis; the hair was broken a short distance from the scalp and the whole interior occupied by the spores. In 1845 Malmsten described this fungus independently, and Hebra also described a similar fungus.

Since that time the belief in a fungus as the cause of Ringworm has taken firm root, and no one now has any doubt in the matter. For long it was not suspected that different forms of Ringworm might be due to different varieties of fungus, but recent investigations, chiefly, perhaps, those of Sabouraud have clearly demonstrated that there are several different forms. Two main varieties are generally recognised - a small spore and a large spore variety; the latter is sub-divided into (a) a form growing inside the hair and (b) a form growing outside or chiefly outside.

The small spore form is known as *Microsporon Audouini* and is the chief cause of Ringworm of the head in children. It is a disputed point whether or not it may cause ringworm elsewhere. M. Sabouraud holds that it is confined to the scalp, but Mr. Malcolm

(8)  
Sabouraud.  
Les Trich-  
(8)ophyties  
Humaines.

Morris<sup>(9)</sup> differs from him, and quotes a case of *Tinea Circinata* in a child who had *Tinea tonsurans*, a scraping from the patch of body ringworm shewing the small spore fungus. He also mentions that Bodin, too, has found a fungus, corresponding in every respect to *Microsporon Audouini*, in body Ringworm. It is, however, unusual to have Ringworm anywhere, except on the scalp, due to the small spore fungus though it is not the only fungus which causes scalp Ringworm.

(9)  
Morris.  
Op. Cit.  
p. 47.

If we examine, under the microscope, a hair from a case of *Microsporon* Ringworm, and which has been treated with *Liquor Potassae*, we see it is covered with a host of small round bodies arranged in no particular order, but, where specially numerous, forming a mosaic on the surface of the hair. These are the so called spores or conidia; they are piled up along the borders of the hair, and on focussing up and down it is seen that they cover the whole surface. The appearance has been compared to fish-row. The spores are situated between the hair shaft and the inner root sheath, and, in untreated cases, extend upwards beyond the mouth of the follicle, giving rise to the whitened sheath before mentioned. The spore mass thins off towards the root and towards the free end of the hair. If

the hair has been extracted entire the bulb may shew a number of spores arranged in columns on the surface. This must not be mistaken as shewing it to be one of the large spore forms, of which this arrangement is distinctive, because as Adamson pointed out, and is supported by Fox and Blaxell<sup>(10)</sup> in the hypothesis, it is probably brought about by epilation. As we ascend the hair from this point the spores become more numerous and grouped and finally come to press one another and from the mosaic characteristic of the form. The individual spores are round or sometimes oval, but from mutual pressure they sometimes become many sided. In size they are from 2 to 3 micros, and frequently shew nucleation. The end of the hair is frayed and presents the appearance of a crush, and mycelial threads are frequently seen projecting from the broken ends of the hair.

A break here and there in the spore sheath reveals the presence of threads of mycelium at a deeper level and within the hair. These threads are transparent and the edges more or less parallel, but here and there shewing bulging. These threads branch dichotomously and are segmented at irregular intervals.

Dr. Allan Jamieson<sup>(11)</sup> considers that the so called

(10)  
Fox and  
Blaxall.  
On the Plur-  
ality of  
Ringworm  
Fungi, Brit.  
Jour. of  
Dermatology,  
July 1896.

(11)  
Jamieson.  
Dis. of the  
Skin, p. 553.



spores are simply divisions of the mycelium, brought about by a tendency which the mycelium has to become segmented at intervals corresponding to its diameter, a separation taking place at the division and the portions thus set free form the spores. Thin also does not consider them true spores; he says<sup>(12)</sup> "only once did I observe an appearance which I considered absolutely distinctive of regular spore formation." Fox and Blaxall in their paper describe at the junction of the shaft of the hair with the bulbous portion a fringe composed of delicate threads of mycelium, which they consider quite characteristic of Microsporon. This fringe is not described by French observers.

There is some division of opinion as to the point at which the fungus attacks the hair. All observers are agreed that it does so within the follicle. Some authorities e.g. Sabouraud and Malcolm Morris think that the hair is attacked near the top of the follicle and that the fungus from this point grows downwards. Others, however, think that the fungus works its way down to the bottom of the follicle, attacks the hair in this position and grows upwards. Dr. Crocker says "I have also seen conidia at the very bottom of the follicle prior to the invasion of the shaft" (13)

(12)  
Thin.  
Pathology  
and Treat-  
ment of  
Ringworm,  
p. 13.

(13)  
Crocker.  
Dis. of the  
Skin, 1888  
p. 653.



Probably both views are correct and that sometimes the hair is attacked in one place and sometimes in another and on occasion possibly in several.

The disease is confined strictly to the hair follicle and its immediate neighbourhood. The fungus does not penetrate beyond the inner root sheath. There are, however, changes which take place in the surrounding tissues. The following description is condensed from Dr. Unna's "Histopathology of Diseases of the Skin" translated by Dr. Norman Walker; it is from a case of beard Ringworm. The fungus threads are found first between the cuticle of the hair and the horny layer, and later, between the horny layer and the root sheath (inner root sheath). The fissure between the two epidermic layers has been widened, and the hair loosened in the sheath. Where a hair has been removed there can be seen, at the base of the follicle, a smooth, hollow cylinder covered by the cuticle of the hair sheath, and parallel threads running from above downwards. The blood vessels are dilated, and the epidermic and cuticular cells show hyperplasia, more especially around the papillary vessels and hair follicles. Sometimes around the dilated capillaries we see a broad mantle of cells. The lymph spaces are,

in general, enlarged, but the elastic tissue is normal. As the process proceeds the hyphae on the surface disappear or become angular rudiments which it is difficult to recognise. Those in the follicle have broken up into spores, cubicle in shape and rarely round (this of course is the large spore variety of fungus). The hyphae grow into the hair in places. The underlying part of the cutis is the seat of a very dense growth of cells with no special arrangement around the vessels. The upper part of the cutis shews a more sparing hyperplasia of connective tissue cells; the free interspaces also shew a simple connective tissue hyperplasia. Sometimes in the centre of the cell-mass there is a small purulent-looking area. Sections from a node which had been treated with Mercury Carbolic plaster muslin, shewed softening and resorption of the fungi from the surface of the follicles, and those of the hair have disappeared. There was general moderate leucocyte infiltration permeating the epithelium, and a simple atrophy of plasma cells, very wide lymph spaces being left. A section from a case of Kerion shewed similar changes, the differences being due to the closely set hairs of the scalp. I have been unable to obtain material to make sections of these

conditions and have therefore simply condensed Dr. Unna's description.

Another debatable question is as to whether the hair or the epidermis is first affected. Mr. Morris<sup>(14)</sup>

agrees with Sabouraud in thinking that the hair is attacked first and that the epidermis is only secondarily affected. Drs. Fox and Blaxall<sup>(15)</sup> on the other hand are at one with Adamson in thinking that the epidermis is first affected. As we seldom see a case

of Ringworm at the very beginning of an attack it is somewhat difficult to decide this question, but in all probability were cases seen early enough a mycelial felt work would be found on the scalp even before the hairs are implicated; but as the hairs become affected the "Tinea circinata character disappears"<sup>(15)</sup> We must also bear in mind that most cases of Ringworm are suspected to be such and a remedy of one kind or another applied before medical advice is sought; the treatment applied may be quite sufficient to cure the skin condition without at all affecting the buried part of the hair. The skin, then may be affected and healed before a medical man sees the case.

The large spore varieties of fungus are responsible for about 15 or 20 per cent of scalp Ringworms and for

(14)  
Morris.  
Op. Cit. p. 42.

(15)  
Fox & Blaxall  
Op. Cit.  
Brit. Jr. of  
Dermatology,  
July 1896.

all cases occurring elsewhere than the head with a very few possible exceptions. On the scalp cases due to these varieties are much milder than those due to *Microsporon*. The stumps have no whitened sheath and are very short, the hairs frequently breaking off on a level with the skin, but sometimes they may be longer than in *Microsporon*.

There are two distinct varieties. The *Ectothrix* variety is the cause of Ringworm of the nails, all beard cases, a very small proportion of scalp cases, and of more than half of the cases of body Ringworm. As a rule the lesions due to this form are single and more amenable to treatment than the other varieties.

Microscopically examined we find the fungus limited to the portion of the hair within the follicle for the most part. It forms a sheath around the hair, and Sabouraud thought that it was confined entirely to the outside of the hair. Later observations, however, shew that it may sometimes at all events, affect the hair to a much greater extent and enter its substance. It has, therefore, been called *Endothrix*. As compared with *Microsporon*, the spores are larger, varying from 4 to 12 micros. in different cases. This, however, is not the most distinctive feature which is rather the arrangement of the spores.



Whereas in *Microsporon* these form a mosaic around the hair in the case of *Endo-Ectothrix* they are arranged in chains. In cases of *Tinea circinata* the mycelium is much more prominent than the spores; it occurs in long slender threads, sharply defined, jointed at irregular intervals and branching dichotomously. In the hair it runs parallel with the long ascis.

The *Endothrix* variety of fungus, as its name implies, attacks the interior of the hair. It is the cause of about half the cases of *Tinea circinata* and of certain cases of *Tinea tonsurans* and may also cause *Onychomycosis*. There are two main types, one with resistant mycelium, and one with fragile. Aldersmith's "black dot" ringworm is due to the variety with fragile mycelium in which the hairs break off at the mouth of the follicle. In the resistant form the stumps are of variable length though mostly short and bent. In both forms the mycelial threads run in the direction of the hair and occasionally shew dichotomous branching. The spores have a double contour and are jointed end to end; in the resistant form they are cubicle and in the fragile more rounded and sometimes irregular. As in the *Ectothrix* variety they are arranged in chains though at first this may not be very evident



in the fragile form, and tends to be disturbed under the action of Liquor Potassae. In the resistant form they present very much the appearance of a ladder. The size varies from 5 to 7 micros. These large spore forms attack the hair from below and grow upwards which Sabouraud thought distinctive. Fox and Blaxall however state that sometimes the hair is attacked at a higher level.

Some authorities think that Kerion is always due to the Ectothrix variety and Sabouraud is of opinion that it is due to a special pyogenic form. Mr. Morris (16) however, says "---- in every case of Kerion which I have examined, I have found a fungus similar to the small-spored form." Kerion is a rather uncommon development, and since I began this study I have met with only one case, in which the fungus, if not Microsporon is certainly indistinguishable from it. Fox and Blaxall do not go so far as to admit that Microsporon may give rise to Kerion but limit themselves to the statement "that in cases of Kerion a fungus may be met with, which it may be very difficult to distinguish from Microsporon. It should not be forgotten that certain patches of an undoubted Microsporon

(16)  
Morris.  
Op. Cit. p.48.

infection inflame very readily under irritant treatment and may thus simulate Kerion."<sup>(17)</sup> My own case, however, was an undoubted Kerion with all the characteristics of that condition and I do not think there is any doubt as to the fungus being Microsporon.

(17)  
Fox & Blaxall  
Op. Cit.  
Brit. Jr. Dem.  
Aug. 1896.

Stained specimens bring out the points referred to above very clearly and have the advantage over specimens prepared with Liquor Potassae of being more permanent. Mr. Morris's method as modified by Dr. Norman Walker is the one I have used; it consists of staining with a solution of Gentian violet in Aniline oil water and decolourising with Iodine. The fungus takes on the stain while the hair remains free.

#### Mycology.

Many observers have made cultivations of the various forms of fungus, from which they come to certain conclusions. There is considerable difference in the results of these cultivations; the reason being that not only may the same fungus exhibit differences in different places, but also according to the exact medium in which it is grown. Thus Fox and Blaxall<sup>(18)</sup> to begin with made their medium according to Sabourand's formula, but with ingredients of other makers, with the result that though the fungi flourished well the

(18)  
Fox & Blaxall  
Op. cit.  
Brit. Jr. Dem.  
Sept. 1896.

appearances were totally unlike those of Sabouraud. They then obtained the same peptone used by Sabouraud, and from himself some of the Maltose, the factory from which he had obtained it having been closed. With this new agar preparation the results corresponded almost exactly with those of Sabouraud. That observer himself says that since the maltose factory closed he had not obtained quite the same results as formerly. As so little difference in the medium makes so great a difference in the results it is not at all easy to compare the results of different observers; and even in comparing the results of the same observer, but obtained at different times, great care must be taken.

Up till now it has not been found easy to place the Microsporon in any particular botanical group. Sabouraud would limit the name Trichophyton to the large spore forms of which he considers there are many varieties, and classifies them with the "Sporotrichum Botrytis" family, which is characterised by a grape-like formation of external spores. Microsporon, he would place in a class by itself as being peculiar, basing his decision on the mode of fructification which he does not consider true spore formation. Fox and Blaxall, however, do not agree with him on this

point, but consider that Microsporon and Trichophyta belong to one and the same family. I think that these observers have shewn very well in their paper, that the modes of fructification of the two types are developed on a precisely similar plan, and that they are nearly related members of the one family. Their observations were made by means of Klatsch specimens which they think much better than the "hanging drop" method used by the continental authorities.

These observers come to the conclusion that differences in the results recorded may quite well be due to different methods of examination and other circumstances, and not necessarily to differences in fungi.

Atkinson<sup>(19)</sup> regards the Ringworm fungus as allied to Mucor Mucedo and Morris<sup>(20)</sup> thinks it in many respects identical with Penicillium; whilst Thin<sup>(21)</sup> again considers it different from any ordinary fungus, and found it possible to grow Penicillium, Asperillus and other fungi on Media in which Trichophyton tonsurans was sterile. Much investigation is still needed to decide the point, but, unfortunately, it is not, from the clinical standpoint, of very much consequence to what special family the fungus belongs.

(19)  
Atkinson.  
New York  
Med. Jour.,  
Dec, 1878.

(20)  
Morris.  
Jour. Roy.  
Micr. Soc.,  
1883.

(21)  
Thin.  
Proc. Roy.  
Soc.,  
1881 & 1885.



Summary.

The present position of Ringworm may then be summed up thus:- It is a contagious skin disease which may attack any part of the body, but shews marked preference for certain parts, notably the head, the beard, sides of the neck, and outer sides and back of the hands and wrists. The body form is easily cured, but when it occurs in a hairy region it is always more or less chronic, especially on the head and particularly one form. This chronicity is in great part due to the difficulty of efficiently applying remedies.

The cause is always a fungus growth of which there are two main types of clinical importance - a small spore form causing the great majority of cases of scalp ringworm which is practically confined to children; and a large spore form producing a certain proportion of scalp cases and all cases of beard and body ringworm. The small spore variety is much more virulent and obstinate to treatment than the large spore form, and is confined to the head. The large spore type is sub-divided into a form affecting the inside of the hair and a form affecting the outside; this may, however, be an accidental difference in distribution. The different forms of Ringworm are thus due,



not only to the situations affected, but also to a difference in the cause.

Some anomalous forms of Ringworm occur which may simulate other affections e.g. "bald ringworm" presents an appearance exactly similar to Alopecia areata, but as a rule the history of the case and microscopic examination of the hairs decide the point.

In all probability one attack does not, as we have seen, produce immunity from further attacks.

Alopecia Areata.

Strictly speaking this term ought to be limited to patches of localised baldness, but practically it is used to denote any baldness occurring to any extent and which is not necessarily permanent. The proportion it bears to other skin diseases varies in different countries. Crocker gives the following proportions:- England 2 per cent; Scotland 1.5 per cent; France 3 per cent; Germany 0.5 to 0.8 per cent; America about 0.5 per cent. At the Edinburgh clinic, of the last 2000 cases of skin disease 5.5 per cent were Alopecia. Three of them were universal alopecia, two were beard cases, and one was following upon ringworm. There is a probable fallacy in the above figures. It is this: patients do not as a rule know about Alopecia and are very anxious to know if it be ringworm which they do know. If told by their Medical advisers that it is not, they are satisfied for the time being, but, as the condition persists they seek further advice, and the Infirmary, (where they consider they get the highest opinion), in this way probably gets most of the cases in the neighbourhood at one time or another. This does not hold good for Ringworm, because, as stated patients

know as a rule that it takes a long time to cure and when they know that they (or rather their children) have the disease they know they must wait for the cure.

Commonly Alopecia Areata occurs in one or more patches on the head. The favourite sites for a commencing case are, on one or other side of the occiput over the insertion of the Trapezius muscle, to one side of the crown, and behind or above the ears. It also attacks the region of the beard either in conjunction with the scalp or quite independently. Usually there are more areas of baldness than one present, varying in size from very small patches of, say, the size of a "threepenny bit" to about two inches diameter. The whole head may be quite bare, and sometimes the process spreads till the entire body is devoid of hair. The shape of the patch is commonly round but it may be irregular, due to two or more patches running into one, or to a single patch spreading more rapidly at one part than another. At the very beginning the bare area may be slightly reddened but this soon passes off and leaves the place of the characteristic ivory white appearance which has been so aptly likened to a billiard ball. It is perfectly smooth and bare, and at the edges the hairs in a

progressing case are looser than normal. In some cases short stumps are found at the margin, which when extracted are seen to be club-shaped or like a mark of exclamation. (!) due to the root part being atrophied. This appearance may be looked upon as characteristic of Alopecia areata, although, as we saw in considering Ringworm, certain cases of that disease may exhibit similar hairs.

The scalp of the bare part is quite freely movable over the subjacent tissues, but when a case has lasted some time, it may become adherent to them and cannot be pinched up. There is usually some depression of the surface due, probably, to the absence of hair, and in old-standing cases this is more marked. The scalp is not less sensitive than usual, but it is less easily irritated by irritant applications. Sometimes the disease appears along the course of a certain nerve, or it may form a broad band running round the head. (22) It is most common amongst young people, but is by no means rare in adults under forty. The commonest age at the Edinburgh clinic is under twenty. It is said to be more common among dark-haired people, and has even been said to occur only in them; but this is not the case, as I have seen it occur repeatedly in fair-

(22)  
Crocker.  
Dis. of the  
Skin, p. 757.



haired people. Crocker<sup>(23)</sup> reports an instance where the mother of a family and two sons, all dark-haired, had it, while the father and daughter, both fair, did not have it.

(23)  
Crocker.  
Dis. of the  
Skin.  
p. 760.

Sex seems to have a different influence in different places; whereas some observers, for example Montgomery<sup>(24)</sup> say it has no influence, others say it is more prevalent amongst women; Jamieson says "the disease is certainly more common in women than in men."<sup>(25)</sup> There are other authorities again who consider it more common amongst men. Crocker's<sup>(26)</sup> statistics are that of 207 cases 112 were males and 95 females. My own observations bear this out, as of 136 cases 88 occurred in males and 48 in females, and they also seem to shew that the proportion of men to women increases with the age; thus in the first decade of life there were 3 males to 2 females, in the second there were  $3\frac{1}{2}$  males to 2 females and after this 4 males to 2 females.

(24)  
Montgomery.  
Twentieth  
Century  
Practice.  
Vol.V p. 590

(25)  
Jamieson.  
Dis. of the  
Skin, p. 469.

(26)  
Crocker.  
Op. Cit.  
p. 760.

Second attacks are by no means uncommon, and sometimes we meet with patients who have had repeated attacks. The onset of Alopecia is usually sudden "sometimes the patient on waking up in the morning finds quite a number of hairs on the pillow, and going to

the looking-glass sees the characteristic white bit of bare scalp." (27) Morris says "I have known the entire hair of the body thus shed within forth-eight hours." (28) The spread also is often alarmingly rapid. The disease may progress in one of two ways; by the rapid spread of the primary patch which takes place peripherally, or by the formation of fresh patches, the original one remaining more or less stationary. The condition may spread indefinitely or it may be arrested at any stage. The condition usually, however, becomes arrested sooner or later, and a fresh growth of hair takes place. This may, and usually does, fall out again two or three times before it becomes strong and healthy. Dr. Jamieson<sup>(29)</sup> mentions the case of a woman with total baldness of the head and eyebrows, who, with each confinement, had a fresh loss of down which had been fairly plentiful between the confinements. The young hairs which appear are always colourless and when there are several patches give the head a curious piebald appearance.

#### Etiology.

The question of the causation of Alopecia Areata has given rise to much debate. There are two hypotheses, one that it is a tropho-neurotic condition and

(27)  
Montgomery.  
Twentieth  
Cent. Practice,  
Vol. V 589.

(28)  
Morris.  
Dis. of the  
Skin, 1897,  
p. 449.

(29)  
Jamieson.  
Op. Cit.,  
p. 469.

the other that it is parasitic. There are many points in favour of each and a great division amongst authorities, some maintaining that it is the one and some that it is the other, while others again think that some cases may be tropho-neurotic but that others are parasitic. Bazin considered it parasitic, and Tilbury Fox in 1873 while maintaining this view thought he stood alone in doing so. Hillier, Besnier, and Bowen all support the parasitic theory. At the present time Hutchinson and Crocker are its chief supporters in this country. Hillier<sup>(30)</sup> reports an outbreak in a large school in Hanwell in which 43 girls in one part of the building all became affected with it after a bad case had been admitted and allowed to mix freely with the others. In the root sheath of some of the hairs the spores of a fungus very like that of *Tinea tonsurans* were found. Bowen<sup>(31)</sup> also records an instance occurring in an orphan asylum where of 69 girls present 63 became affected with the disease to a greater or less extent. Crocker<sup>(32)</sup> again gives a series in which eight children of one family had on their heads a few small perfectly bald spots, which had been so from the first, and never more than half-an-inch in diameter. After a time their governess became affected,

(30)  
Hillier.  
Hndbk. of  
Skin Dis.,  
p. 236.

(31)  
Bowen.  
Brit. Jour.  
Derm.,  
March, 1894.

(32)  
Crocker.  
Op. Cit.,  
p. 761.

having three pea-sized, oval bare spots; she went home and being told by a doctor that it was Alopecia Areata and not contagious she slept with her adult sister who soon afterwards exhibited similar spots on her head. The mother of the eight children also became affected, and in one of the hairs extracted from the border Crocker found distinct fungus elements indistinguishable from those of *Tinea tonsurans*. In this series all the patches were small and there were never more than three, and in one of the children there was a history of a red ring on the side of the cheek. Crocker adds "Of course it is not contended that it is readily contagious like ringworm, only that under favourable circumstances it may be communicated from person to person."

With regard to the nerve theory no one has as yet been able to say definitely how it acts, but it is supposed that an inhibitory influence is exerted on the hair and papilla, so that the old hair loses its vitality and falls off, while the new hair has not sufficient vitality to grow. Dr. Allan Jamieson, who has examined a portion of skin from a case says "The examination of portions of skin taken from the bald patch shows changes which point rather to suspension



than suppression of the function of hair production." (33)

Such sections shew atrophy of the hair follicles and sebaceous glands, and an infiltration of new cells reaching from the cutis to the papillary body and surrounding the follicles and blood vessels and capillaries of the papillary body. The atrophied hair follicles shew more epithelial buds than usual.

Immediately around the follicles there is connective tissue hypertrophy. In sections of skin taken from the patch during life Robinson<sup>(34)</sup> always found appearances of inflammation, as well as peri-vascular, though not particularly so and not very wide spread, infiltration with round cells. In recent cases the lymphatics were dilated and contained coagulated lymph, and some of the smaller arteries contained thrombi. In older cases there was thickening of the blood-vessel walls, and in all the lymph spaces he found cocci which he considered the cause of the disease. In all cases the epidermis and coil-glands are normal. Robinson says that in recent cases, of the appendages of the skin only the hairs are affected, that later the glands also atrophy, and very late the fatty tissue does so. This description is taken from Unna's "Histopathology of Diseases of the Skin" where he cites

(33)  
Jamieson.  
Op. Cit.,  
p. 470.

(34)  
Robinson.  
Morrow System  
of Dem.  
p. 863.

as authorities, Harris, Robinson and Giovannini. The last observer used a staining method, employing Gentian violet and decolourising with Chromic acid. He looks upon Alopecia as a deep-seated folliculitis, and ascribes the degeneration of the hair substance to the leucocytosis interfering with the nutrition of the hair and leading to death of the matrix.

Unna thinks that the diminution of the deeper parts of the hair before its casting is a simple atrophy and displacement such as occurs normally, and that the peculiarities and irregularities of the end of the hair are explained by the greater intensity and rapidity of the process. He has used all known staining methods. He says that in the first stage there is hyperoemia localised in the upper and middle parts of the cutis and which usually escapes notice. This is accompanied by oedema of the whole cutis which is shown by the dilated lymph spaces and vessels and by swelling of the fibrous tissue. This hyperoemia and oedema Unna considers are inflammatory and not merely mechanical as is shewn by the increase of connective tissue cells around all the dilated vessels.

Microscopic examination of the hairs shews atrophy of the root; and the atrophied part is seen to have

no medulla; they have become bed hairs. This points to a trophic nerve disturbance, the normal change which should be operative over the scalp as a whole being probably localised to one or two spots and much exaggerated. Other facts that support the nerve theory are the sudden onset of the disease; its occurring sometimes along the course of a nerve; its frequent occurrence as the result of a shock, (as for example, Mr. Morris's case of a lady who developed total Alopecia within forth-eight hours of the receipt of the news of her son's death);<sup>(35)</sup> its occurrence also after periods of prolonged worry and strain. It sometimes follows a blow, but this cannot be taken as altogether supporting a nervous causation, because the mechanical injury may be quite sufficient to cause it, i.e. by acting directly upon the hair forming tissues. Repeated attacks, which, as we have seen are frequent, lend some support to the nerve theory, though it is quite conceivable that we may have repeated attacks of a disease due to a parasitic cause.

As before stated some authorities divide cases of Alopecia into those due to a parasitic cause, and those due to a tropho-neurosis. Crocker,<sup>(36)</sup> indeed, divides them into four classes:-

(35)  
Morris.  
Op. Cit.,  
p. 501.

(36)  
Crocker.  
Op. Cit.,  
p. 752.

- (1) Universal cases, usually of rapid development and not necessarily in patches.
- (2) One or more patches in the course of a nerve or on the site of an injury.
- (3) Alopecia circumscripta of Neumann, with small depressed patches.
- (4) Patches or bands of irregular distribution and with characteristic(!) hairs as borders of spreading patches.

He says the first two are undoubtedly tropho-neurotic, the third is probably so, but that the fourth, which forms the largest proportion of cases, is in his opinion parasitic. He calls this fourth class true Alopecia areata and suggests the advisability of renewing the old name of "Tinea decalvans" or calling it "Alopecia Parasitica."

If Alopecia areata be due to a parasite, what is the nature of it? Some think that it is the same as causes Ringworm. Mr. Hutchinson<sup>(37)</sup> thinks that every case of Alopecia has been preceded at a longer or shorter interval by Ringworm. Even were this so, it does not prove anything, because Ringworm is so very common that it would be curious if some at least of the victims of Alopecia had not at one time suffered

(37)  
Hutchinson  
Archives of  
Surgery.  
Vol. I  
pp. 162, 370.  
Vol. II  
pp. 74, 100, 270



from it. But I do not think that it is the case. In some cases one does get a history of Ringworm, in others there is no definite history one way or the other, and in others there is an emphatically negative history of ringworm. In my own experience so far there has in most cases been a distinct history of no Ringworm. Besides I do not think that an attack of Ringworm some ten or twelve<sup>or</sup> more years before the onset of the Alopecia can have any bearing upon it. Again, we must bear in mind that if we begin an investigation with the object of proving a certain point, it is easy to make ourselves believe we see points bearing out what we wish to prove.

Crocker supports Hutchinson in his view that Alopecia is due to an organism, and that the same as causes ringworm, and points out that "in those countries, like France and England, where *Tinea tonsurans* is most frequent, so also is *Alopecia areata*." (38)

This does not seem to me to lend much support to his theory because if we carry the same line of argument a little further, then where we find one form of Ringworm most abundant there we should also find the other forms most abundant; which is not the case in practice, as we have seen. The fact that certain cases of Ringworm present such a striking likeness to Alopecia

(38)  
Crocker.  
Op. Cit.,  
p. 762.

even to the presence of the mark of exclamation (!) hairs which has been noted by both Crocker and Aldersmith, does not prove anything either, although at first sight it seems strong corroborative evidence in favour of the ringworm theory. Two dissimilar causes may produce similar effects, e.g. the production by Belladonna of a rash similar to that seen in Scarlet Fever. Indeed while Crocker<sup>(39)</sup> uses the above fact as supporting his theory of the relationship of Alopecia to Ringworm, Aldersmith<sup>(40)</sup> uses <sup>it</sup> as showing that Ringworm may simulate Alopecia. In looking for the fungus Crocker says it is no use examining the stumps but that we must search the long loose hairs to be found at the border, and not all of them, but only those with most root-sheath attached rejecting those with smooth atrophied roots, and even then the fungus may only be found in the root-sheath of one of several selected hairs. I have examined stumps and loose hairs both without and with root-sheath attached, both by means of Liquor Potassae and staining, but have so far failed entirely to find anything like the fungus of Ringworm. It is true that Crocker considers Alopecia Areata and bald Tinea tonsurans as identical,<sup>(41)</sup> and this may explain his finding the ringworm fungus in

(39)  
Crocker.  
Op. Cit.,  
p. 762.

(40)  
Aldersmith.  
Op. Cit.,  
p. 71.

(41)  
Crocker.  
Op. Cit.,  
p. 768.

cases of what he calls Alopecia areata.

The clinical features of the two disease are very different in many respects. The usually sudden onset of Alopecia is very unlike the gradual appearance of a ringworm patch. Instead of the smooth bare spot of Alopecia we have in Ringworm the rounded patch covered with stubbly hair. The ivory whiteness of an Alopecia patch is quite unlike the bluish grey or reddish brown of ringworm. If there are any scales in Alopecia they are very fine and frequently escape notice altogether, while there is no doubt of the scaling in Ringworm. In those cases of Ringworm which do present these features of Alopecia so that by inspection we cannot well tell what the case is, the history as a rule guides us to a diagnosis. Should the history fail us, as it sometimes does, the microscope may help us, but even with that we are sometimes, I must confess, left in doubt. The positions in which the disease began is a help to us, as those places where Alopecia usually commences - one side of the occiput or crown or above or behind the ear or low down on the neck are the very places where Ringworm is rare. (42) Aldersmith (46) says that Alopecia is frequently symmetrical while Ringworm is not.

(42)  
Jamieson.  
Op. Cit.,  
p. 472.

(46)  
Aldersmith.  
Op. Cit.,  
p. 67.

Although Alopecia Areata may be symmetrical, it is too rarely so to make it a strong point in diagnosis.

Although as we saw Ringworm probably does not confer any real immunity it does not exhibit much tendency to recur, while Alopecia on the other hand has a very marked tendency to do so. There is frequently in Alopecia a thinning of the scalp and loss of vitality generally (upon which our prognosis is based) which do not present themselves in Ringworm.

Gruby certainly described a fungus in connection with Porrigo decalvans, but as already stated he was really describing a form of Ringworm ( ). Thin in 1887 says<sup>(43)</sup> "But, without throwing any doubt on the fact of their (i.e. Ringworm and Alopecia Areata) occasional co-existence, I am satisfied from observation of alleged cases that some of them at least are cases of ringworm in which baldness caused by Trichophyton has been mistaken for Alopecia. There is absolutely no connection between the two diseases." Aldersmith considers that much confusion has been caused by those mixed cases of Alopecia and Ringworm<sup>(44)</sup> and mentions the case of a girl who was brought to him for Ringworm while recovering from Alopecia Areata, and in whom he found four patches of Tinea tonsurans, one in the

(43)

Thin.  
Path. & Treat.  
of Ringworm,  
p. 40.

(44)

Aldersmith.  
Op. Cit.,  
p. 279.



centre of a recovering patch of Alopecia, and goes on to say "I have also caused a condition exactly resembling true Alopecia areata to come on during the treatment for Tinea tonsurans."<sup>(45)</sup> Liveing is another authority against the idea of any connection existing between Ringworm and Alopecia; he says that cases of bald Tinea tonsurans may have been mistaken for Alopecia. He mentions having heard Professor Kaposi remark that "he remembered that the late Professor Hebra and he diagnosed a case as Alopecia which turned out to be Tinea tonsurans" and continues "If this mistake could have happened to the first dermatologists of our time, it may easily occur to less able observers,"<sup>(47)</sup> As of the parasitic origin of Alopecia, so of its connection with Ringworm, Hutchinson and Crocker are the chief advocates but they do not seem in entire agreement. Whereas the former says that those who as adults have Alopecia, have, as children had Ringworm, Crocker holds that Alopecia and bald ringworm are identical, and that no reliable clinical distinction can be drawn between them.

Apart, however, from any connection with Ringworm, may not Alopecia be due to a parasite? The latest investigations on this point are those of M. Sabouraud.

(45)  
Aldersmith.  
Op. Cit.,  
p. 281.

(47)  
Liveing.  
Hndbk. of  
Skin Dis.,  
p. 250.

He has conducted a series of investigations on the subject and comes to the conclusion that an organism is always to be found, and that this organism is the same as is found in Seborrhoea and in Acne. It is found in the peripheral zone in the upper third on the hair sac. Sabouraud found the upper part of the hair follicles filled with a fatty substance, to which he gives the name "Seborrhoeic cocoon" and which can be expressed. In this he found, besides other organisms, one which he always found in histological preparations from a case of Alopecia. He experienced some difficulty in separating this organism from the others. After many experiments he discovered a medium on which only this organism and another white coccus which was very persistent, grew. This was a very acid medium made up of Peptone 20 grammes; Glycerine 20 grammes; Acetic Acid 5 drops; Water 1000 grammes; Gelose 13 grammes. The white coccus was got rid of by using an immunised gelose; this he obtained by preparing it with a liquid in which the white coccus had been grown. Another method he found successful was to keep the culture at a temperature of  $65^{\circ}\text{C}$  for 10 minutes, which kills the white coccus but not the bacillus. By means of this culture he was able to produce bald patches in rabbits in some instances.

Sabouraud then made a cultivation on a liquid

medium and filtered it through porcelain. This filtrate he injected into the skins of rabbits and within forty days general Alopecia was established. This seemed to show that the toxins of the bacillus were able to act from a distance on the papillae of the hairs. This bacillus Sabouraud considers to be the same as is found in seborrhoea and in acne and to be the cause of the first two conditions; in the last condition he found another organism acting in conjunction with it. The mechanism of the production of baldness is as follows: The bacillus finds its way into a follicle and produces around it, especially at the base around the papilla, an afflux of wandering cells; the papilla atrophies and the hair it produces becomes more and more frail, and less and less pigmented, and finally dies and is expelled.

What strikes one here as strange is that the same organism should be the cause of two such very dissimilar conditions as Seborrhoea and Alopecia Areata. It is true that all dermatologists look upon Seborrhoea as a cause of baldness, but this baldness is not like Alopecia areata; it does not occur in patches but is general and on the top of the head, while Alopecia frequently occurs lower down. Though Seborrhoea may cause baldness it does not invariably do so; I have

known people who have had Seborrhoea for years but who shew no signs whatever of baldness. Nor is baldness (I mean general baldness other than senile) confined to those who have Seborrhoea, many people being bald who never have had Seborrhoea. It is difficult to see why the areate baldness should be confined to certain places if the cause is spread over the head generally, and besides Seborrhoea is usually absent in those who suffer from Alopecia Areata.

In 1882 Thin found certain bacteria between the root sheaths and hair-shafts in hairs taken from the margins of a patch of Alopecia areata.<sup>(48)</sup> Kanzali<sup>(49)</sup> found a micro-organism always present. Unna also mentions a coccus which, he says, is also present in healthy hairs.

I think we are justified in concluding that Alopecia Areata is in many cases produced by a nervous cause, but that in all probability certain cases are due to a parasite. The nature of this parasite has not yet been definitely demonstrated; but the clinical evidence is so strong in its favour that we cannot deny the possibility at least of its presence, even though the majority of investigators have failed <sup>entirely</sup> to discover any organism. The evidence in favour of

(48)

Thin.  
Brit. Med. Jr.,  
Vol. II, 1882,  
pp. 783 & 828.

(49)

Kanzali. ~  
Brit. Jour.  
Derm. Fib.,  
1889.



Alopecia Areata being due to the same organism as Ringworm, or even of its being a sequela of Ringworm, is not strong; and the differences between the two diseases more than counterbalance the points which may indicate a relationship between them. M. Sabouraud's views have still to be proved and though many investigators are working at this subject, no one seems so far to have obtained similar results. I have, indeed, heard that he has changed his views, but there is no published evidence of this.

The importance of the question of the causation of Alopecia is great because if proved to be due to an organism, the further question of the isolation of patients suffering from it is raised.

In conclusion I have to express my indebtedness to Dr. Allan Jamieson and Dr. Norman Walker for kindly allowing me to make use of the cases in the Edinburgh Royal Infirmary Skin Department.

## BIBLIOGRAPHY.

- Aldersmith..... Ringworm and Alopecia  
Areata 1897.
- Atkinson..... New York Med. Journ.  
Dec. 1878.
- Bowen..... Brit. Journ. Derm.  
March 1894.
- Crocker..... Dis. of the Skin 1893.
- Fox & Blaxall..... Brit. Journ. of Derm.  
July - Oct. 1896.
- Hillier..... Handbook of Skin Dis.  
1865.
- Hutchinson..... Archio. of Surgery,  
Vols. I & II.
- Jamieson..... Dis. of the Skin 1894.
- Kanzali..... Brit. Journ. Derm.,  
Feb. 1889.
- Liveing..... Handbook of Dis. of the  
Skin, 1887.  
Brit. Med. Journ.,  
April 8th, 1882.
- Morris..... Ringworm in the light of  
Recent Research.  
Dis. of the Skin, 1898.
- Montgomery..... Twentieth Century Practice  
of Med. Vol. V.
- Robinson..... ~~Morris~~ System of Derm.  
Manual of Derm.
- Sabouraud..... Les Trichophytie Humaines  
Les Teignes.

Sabouraud.....Etude Clinique et exper-  
imentale sur les Origines  
de la Pelade, Annales  
de Derm. 1896.  
La Seborrhée Grasse et  
la Pelade, Annales de  
E'Inst. Pasteur,  
Feb. 29th, 1897.  
Origine Microbienne de  
la Calvite, Societe  
Francaise de Derm.,  
Seance du Mars 1897.

Thin..... Path. and Treat. of Ring-  
worm, 1887.  
Brit. Med. Journ.,  
Vol. II, 1882.

-----ooOoo-----

The staining method I have found most satisfactory is Dr. Norman Walker's modification of Mr. Malcolm Morris's method.

The hairs are washed in Ether to remove the fat and then steeped in a staining solution consisting of 5% alcoholic solution of Gentian violet 10 parts, saturated solution of aniline oil in water 30 parts. The stain is fixed by means of Gram's solution of Iodine, and the hairs decolorised by treating them with Aniline oil having sufficient Iodine dissolved in it to give it a light sherry colour. They are then cleaned with pure aniline oil (which is driven off by means of Benzol) and mounted in Canada Balsam in Xylol.

*The small spore variety stains in about five minutes, but the large spore requires from an hour to an hour-and-a-half. Fixing takes three minutes.*



## MICROSCOPIC SPECIMENS.

- I. Small spore Ringworm. Mounted in Liquor Potassae and Glycerine. Shews Spores and here and there Mycelial threads.
- II. Small spore Ringworm. Treated with Liquor Potassae, cleared with Clove oil and mounted in Balsam. The spores are not so well seen as in I but the mycelium is much more prominent, giving an appearance much like Favus. Transverse divisions may be seen in some of the threads, and branching is observed at places.
- III. Small spore Ringworm. Treated with Acetic Acid and mounted in Balsam.
- IV. Small spore Ringworm stained with Picro-carmin. The hair is stained but the spores remain unstained. Not a very satisfactory method.
- V. Small spore Ringworm. Stained with Gentian violet. Spores are stained blue, and are well seen forming a bark around the hair; mycelium is not well seen.
- VI. Small spore Ringworm. Stained with Gentian violet. Shews mycelium much better than V. The long hair is the better specimen.
- VII. Small spore Ringworm. Treated with Acetic Acid before staining with Gentian violet. The isolated hairs are the best specimens.
- VIII. Small spore Ringworm. On the hairs which have been extracted entire the spores over the root end shew some tendency to arrange themselves in lines. This is especially well seen in the hair to the right of the slide.
- IX. Small spore Ringworm. Stained with Gentian violet. Centre hair shews divisions in its length.
- X. Small spore Ringworm. Stained with Fuchsin. The spores are red. This is better for photographic purposes.
- XI. Kerion stained with Gentian violet. Due to small spore fungus especially well seen in the hair to the left of the slide.

- XII. Large spore Ringworm Ectothrix variety stained with Gentian violet. Shewing well marked chain arrangement of spores outside of the hair. Best seen in hair to left of slide.
- XIII. Large spore fungus stained. On the hair to the left of the slide at the broken end some chains of spores are to be seen and at the left border of the hair further up, the fungus may be seen growing into the hair.
- XIV. Large spore Ringworm from a very early case of parasitic Sycosis. The spores here are very small but still arranged in lines though not so well marked as in XI & XII.
- XV. Scale from a case of Tinea Circinata treated with Liquor Potassae. Shews mycelium and spores. Almost on a level with the line of varnish there is a hair running parallel with the long axis of the slide in which the spores may be seen arranged along the hair. This is evidently the Endothrix variety of fungus.
- XVI. Scale from Tinea Circinata case, stained with Gentian violet. Mycelial threads are seen here and there not so deeply stained as the surrounding tissues.
- XVII. Stumps from Alopecia Areata.
- XVIII. Long loose hairs from Alopecia Areata. One short stump shews brush-like extremity.
- XIX. Stumps from Alopecia Areata stained with Gentian violet.
- XX. Young hairs from a recovering case of Alopecia Areata.

-----ooOoo-----